

What is claimed is:

1. A device for breaking rocks comprising:

a hollow cylindrical chamber having a closed lower end, a closed upper end, an access aperture in said closed upper end and an outer circumferential surface;

a cylindrical plunger longitudinally-reciprocally disposed within the interior of said cylindrical chamber, said plunger being biased to a retracted position, the upper end of said plunger having an upper face and a converging portion below said upper face;

at least two spools disposed equally around the circumference of said cylindrical plunger, each said spool including a converging upper end which is configured to be in slidable contact with said converging portion of said cylindrical plunger;

a like at least two hardened inserts, each said hardened insert being secured to an outer face of an associated spool, each said hardened insert having a partial circumferential outer surface, which is coextensive with said outer circumferential surface of said cylindrical chamber, each said spool and its connected insert being biased to an inner retracted position; and

means for applying a hydraulic pressure to said upper face of said cylindrical plunger; whereby

said converging portion of said cylindrical plunger is urged to move downwardly, thereby urging said spools, together with said secured hardened inserts, radially-outwardly, so that said hardened inserts project radially outwardly from said outer surface of said hollow cylindrical chamber.

2. The device as claimed in claim 1, wherein

said converging portion of said plunger is frusto-conical; and

said converging upper end of said spool is likewise frusto-conical.

3. The device as claimed in claim 2, wherein there are four said spools, and four said hardened inserts.

4. The device as claimed in claim 1, further including at least two equalizers resting on the inner face of said closed lower end, and disposed equally around the

circumference of said cylindrical plunger, each said equalizer including a diverging upper face, the lower end of each said at least two spools including a diverging face which is configured to be in slidable contact with an upper diverging conical face of an associated said spool.

5. The device as claimed in claim 4, wherein:
said diverging face of each said equalizer is partially frusto-conical; and
said diverging face of each said spool is partially frusto-conical.
6. The device as claimed in claim 5, wherein there are four said spools and four said equalizers.
7. The device as claimed in claim 4, wherein each said equalizer includes an inner diverging face; and
said cylindrical plunger includes a lower pointed conical end which is configured to be in slidable contact with said inner diverging faces of said equalizers.
8. The device as claimed in claim 7, wherein:
said inner diverging face is partially frusto-conical; and
said cylindrical plunger has a conical end.
9. The device as claimed in claim 1, wherein said cylindrical plunger is biased to its retracted portion by a longitudinally-positioned compression spring.
10. The device as claimed in claim 1, wherein each said spool is biased to said inner retracted position by means of radially-positioned compression springs.
11. The device as claimed in claim 10, wherein each said spool includes an upper said compression spring and a lower said compression spring.

12. The device as claimed in claim 1, wherein said cylindrical plunger includes an upper threaded cylindrical portion, an adjacent, integral, cylindrical portion of greater diameter than said upper threaded cylindrical portion, an adjacent, integral frusto-conical portion, an adjacent, integral, depending cylindrical portion whose diameter is less than the diameter of said upper cylindrical portion, and a lowest integral adjacent conical point.

13. The device as claimed in claim 1, wherein each said spool includes an outer, curved, longitudinally-extending, partial circumferential surface, and an inner curved longitudinally-extending, partial circumferential surface.

14. The device as claimed in claim 1, wherein each said spool includes an outer, curved, longitudinally-extending, partial circumferential surface, and an inner curved longitudinally-extending, partial circumferential surface, an upper converging frusto-conical surface between said outer curved longitudinally-extending, circumferential surface and said inner curved longitudinally-extending, partial circumferential surface, a lower diverging partially frusto-conical circumferential surface between said inner curved longitudinally-extending partial circumferential surface and said outer curved longitudinally-extending partial circumferential surface, and a terminal, partial circumferential flange.

15. A device for breaking rocks comprising:

an upper hollow cylindrical chamber (A) connected to a lower hollow cylindrical chamber (B);

said upper hollow cylindrical chamber (A) comprising:

a closed upper end, said closed upper end including an access aperture;

an upper support ring and a lower support ring;

said lower support ring including an upstanding cylindrical rod and a lower, internally-threaded bushing; and

a compression spring surrounding said upstanding cylindrical rod, an upper end of said compression spring abutting the lower surface of said upper

support ring, a lower end of said compression spring resting on said lower support ring;

said lower cylindrical chamber (B) comprising:

an open upper end;

a closed lower end;

a concentrically-disposed cylindrical plunger, said cylindrical plunger including an upper threaded cylindrical portion threadedly secured to said lower internally-threaded bushing of said lower support ring, an adjacent, integral cylindrical portion of greater diameter than said upper threaded cylindrical portion, an adjacent, integral frusto-conical portion, an adjacent, integral, depending cylindrical portion whose diameter is less than the diameter of said adjacent upper cylindrical portion, and a lowest integral, adjacent conical point;

four spools disposed equally circumferentially around said cylindrical plunger, each said spool including an outer, curved, longitudinally-extending, partial circumferential surface, and an inner, curved, longitudinally-extending, partial circumferential surface, an upper, converging, partial frusto-conical surface between said outer, curved, longitudinally-extending, partial circumferential surface and said inner, curved, longitudinally-extending, partial circumferential surface, a lower, diverging partial frusto-conical surface between said inner, curved, longitudinally-extending, partial circumferential surface, and said outer, curved, longitudinally-extending, partial circumferential surface, and a terminal, partial circumferential flange, said partial frusto-conical upper end of each said spool being configured to be in slidable contact with said frusto-conical portion of said cylindrical plunger;

four hardened inserts, each said hardened insert being secured to an outer face of an associated spool, each said hardened insert including an elongated sliver of a cylinder having an outer curved face and an inner flat face, said inner flat face being secured to said outer face of an associated spool by means of longitudinally-spaced-apart removable securing means;

each said spool and secured insert being biased to an inner retracted position by means of longitudinally-spaced-apart, compression springs, one end

of each said compression spring being anchored within a radial well in an associated spool and being secured, by means of removable securing means, to the outer circumference of said lower hollow cylindrical chamber;

four equalizers disposed equally circumferentially around the circumference of said cylindrical plunger, and resting on the inner face of the lower closed end of said lower cylindrical chamber, each said equalizer including an inner, diverging, partial frusto-conical face which is configured to be in slidable contact with said lower conical point of said cylindrical plunger, an outer, diverging, partial frusto-conical face, and a lower, partially-cylindrical, portion, said outer, diverging, partial frusto-conical portion being configured to be in sliding contact with said lower, diverging, partial frusto-conical portion of an associated said spool, the outer partially-cylindrical portion of said equalizer being configured to be in slidable contact with the partial cylindrical flange of said spool; and

means for applying hydraulic pressure to said upper face of said cylindrical plunger;

whereby said converging portion of said cylindrical plunger is urged to move downwardly, thereby urging said spools, together with said secured hardened inserts, radially-outwardly, so that said hardened inserts project radially-outwardly from said outer surface of said hollow cylindrical chamber.

16. The device as claimed in claim 15, wherein said upper hollow cylindrical chamber (A) is further connected to said lower hollow cylindrical chamber (B) by means of cooperating cylindrical portions of lesser diameter on one said hollow cylindrical chamber (A) or (B) and flange portions of greater diameter on the other said hollow cylindrical chamber, (B) or (A), respectively.